Original Article

Fine-needle Aspiration Cytology in Palpable as Well as in Non-palpable Breast Lesions: A Study of 430 Cases

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Abstract

Background: Fine-needle aspiration cytology (FNAC) is an established, highly accurate, and cost-effective method for diagnosing lesions in different organs including the breast. The method is minimally invasive without unwanted side effects. At present, accurate diagnosis of breast lesions depends on a triple assessment approach that is combined clinical, radiological, and pathological diagnosis. FNAC is widely adopted for pathological diagnosis of different types of the breast lesions. In developing countries, like India, malignant causes as well as non-malignant causes are the most common causes of breast lump. FNAC proves to be a valuable tool in diagnosing these cases.

Aims: This study intended to look the frequencies and various cytomorphological presentations of different lesions on FNAC of breast lump.

Materials and Methods: In a study period of January 2015–December 2017, in the Pathology Department, GMERS Medical College, Ahmedabad, 430 patients of breast lesions for FNAC came. Those were subjected to cytological evaluation with hematoxylin and eosin, Giemsa, Papanicolaou, and Ziehl–Neelsen stained smears. We assessed the age of the patients, lesion size, site, type of lesion, and axillary lymph node metastasis in case of malignancies. In addition, the ultrasonography/mammography of these patients with the clinical presentation was also studied.

Results: Age ranges from 13 to 100 years with a mean age of 38 years. Among the lesions, 31.86% fibroadenoma, 23.02% malignant lesions, 11.81% fibrocystic changes, and 20.23% inflammatory lesions were identified. Mean lesion size was 3.37 ± 2.08 cm. 12 (12.12%) of malignant lesion cases showed metastasis in axillary lymph nodes.

Conclusion: FNAC serves as a safe, rapid, economical, requiring minimal instrumentation, and highly sensitive tool for the diagnosis of different kind of the breast lesions and ductal carcinoma. The cytomorphological examination of these lesions before operation or treatment serves as an important diagnostic modality. The sensitivity can be further increased by complementing with radiological and clinical findings.

Key words: Breast, Cytology, Ductal carcinoma of breast, Fine-needle aspiration cytology, Triple assessment

INTRODUCTION

Breast pathology is one of the most common pathologies encountered in routine practice. Not only the malignant lesions pose a major public health problem but also the benign lesions can contribute to the morbidity and their masquerade as malignancy can cause significant plight to the patients. The high incidence of breast malignancy, its relatively easy detection at an early stage, and effective treatment in the form of conservative surgery and chemotherapy had prompted a worldwide initiation of triple assessment including a clinical (palpation), radiologic (ultrasonography or mammography), and cytological (fine-needle aspiration cytology [FNAC]) assessment.[1,2]

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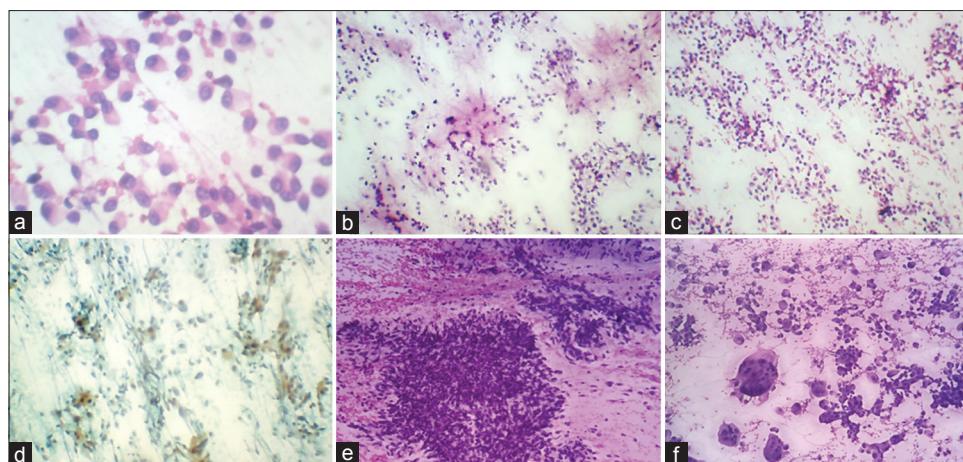E-mail: goyal.vinita25@gmail.com

Figure 1: (a) Neuroendocrine type of breast carcinoma. (H and E × 400), (b) mucinous carcinoma of breast (H and E × 100), (c) ductal carcinoma of breast (H and E × 100), (d) metaplastic carcinoma of breast (PAP × 100), (e) sarcoma of breast (PAP × 100), (f) ductal carcinoma with osteoclastic-type giant cells (H and E × 100)

FNAC is a simple, quick, and reliable as well as cheap technique for obtaining diagnostic material. True fine needles for breast aspirations were first introduced in the beginning of 1960s by Franzén and Zajicek at Karolinska Hospital in Stockholm.[3,4] Being an oncologist, Franzen introduced standard May-Grunwald-Giemsa (MGG) stains on air-dried smears to allow for rapid interpretation.

The artillery of FNAC is fraught with its (1) rapid diagnosis, (2) pre-operative planning, (3) high acceptance, (4) high sensitivity and specificity, (5) ability to sample multiple areas at a single go, (6) sampling of metastatic as well as the primary site, (7) cost-effectiveness, (8) performance of ancillary techniques, and (9) a rapid psychological relief to the patient following a negative diagnosis. In addition, therapeutic aspiration is also possible in case of a cyst. FNAC can be employed in both palpable and non-palpable lesions of the breast, and it is a relatively safe procedure with a low rate of procedure-related complications.

The purpose of our study was to evaluate the accuracy of FNAC in diagnosing malignancy or other non-malignant causes and studying the frequency and distribution of various types of the breast lesions on FNAC in patients with breast lesions in peripheral areas of Ahmedabad.

MATERIALS AND METHODS

A total of 430 patients with palpable or suspected breast lump were aspirated for cytological evaluation in a study period of January 2015–December 2017 at GMERS Medical College, Ahmedabad. Appropriate approval of the institutional ethical committee was obtained for the same. Informed written consent from each patient was also obtained in local (Gujarati) language. The subjects concerned included all the female/male patients which

Table 1: Reporting categories for FNAC breast lesions[5,6]

C1	Unsatisfactory
C2	Benign
C3	Atypia probably benign
C4	Suspicious of malignancy
C5	Malignant

FNAC: Fine-needle aspiration cytology

were referred to the Department of Pathology, GMERS Medical College, Sola, Ahmedabad, from attached Sola civil hospital for FNAC of breast mass. Physical examination of breast mass by palpation was done. Palpable axillary lymph node was also selected for FNAC. Aspirations were performed using 22G/23G needles and disposable 10 ml/5 ml plastic syringe. Aspirated material was spread on 4–5 slides. The smears were fixed with methyl alcohol and stained with hematoxylin and eosin/Papanicolaou stain; one air-dried smear was stained with MGG stain. In cases where aspirated material appeared, necrotic one smear was stained with Z-N technique and an additional slide was kept unstained for any further required stain. Radiological findings of patients also studied. Data were recorded regarding the age of the patient, site of involvement, size of the lesion, cytological diagnosis, and presence of metastasis in case of malignancies.

Cytology findings were grouped into five categories: Unsatisfactory, benign, atypia probably benign, suspicious, and malignant. Specimen adequacy was defined by our cytopathologists, based on the Bethesda conference on breast cytology guidelines, Table 1.[5,6] An adequate benign specimen required at least six well-visualized cell groups. A hypocellular or sparsely cellular specimen was considered unsatisfactory or non-diagnostic. A specimen was considered suspicious if the cellular findings were suggestive but not diagnostic of malignancy; additional

tissue biopsy was recommended in these cases. A malignant diagnosis was made when sufficient well-preserved malignant cells were identified. Typing of benign diseases as well as malignancy was also done.

Table 2: Radiological evaluation of breast lump

USG/Mammography result	Cytology result			
	Malignant	Suspicious	Benign	Total
Overall				
Malignant	96	00	00	96
Benign	03	09	322	334
Total	99	09	322	430
≤40 years				
Malignant	14	00	00	14
Benign	03	04	259	276
Total	17	04	259	270
>40 years				
Malignant	82	00	00	82
Benign	00	05	73	78
Total	82	05	73	160

USG: Ultrasonography

Table 3: The cytological categories of various palpable breast lesions

Cytological categories	*n* (%)
C1 unsatisfactory	12 (2.79)
C2 benign	300 (69.76)
C3 atypia probably benign	10 (2.32)
C4 suspicious of malignancy	9 (2.09)
C5 malignant	99 (23.02)

RESULTS

From the study January 2015 to December 2017, a total of 430 FNAC's of breast were done.

The patients were from 13 to 100 years of age with a mean age was 38 years and median age was 35 years. Of 430 patients, 274 (63.72%) were ≤40 years of age, while 156 (36.28%) were >40 years of age. 21–30 years age group comprises most of the patient (118 = 27.44%) followed by 31–40 years age group (106 = 24.65%)

Of 430 patients, most patients (323 = 75.11%) had imaging before FNAC, while 107 = 24.89% had imaging after FNAC. Table 2 describes the initial imaging evaluation. Most patients had imaging with ultrasound (*n* = 344, 80%). The majority had diagnostic ultrasound (*n* = 292, 84.88%), while 52 (15.12%) had screening ultrasound. 86 = 20% patients imaged with mammography [Table 2].

The cytological spectrum of various palpable breast lesions in the present study shows that out of the total 430 cases, 300 (69.76%) were in the benign category, 10 (2.32%) were in the atypical category, 9 (2.09%) were in the suspicious category, and 99 (23.02%) belonged to the malignant category while the cytology study of 12 (2.79%) cases was unsatisfactory [Table 3].

Among the type of the lesions, fibroadenoma showed the highest (137 = 31.86%) incidence followed by carcinoma

Table 4: Frequency distribution of different categories of lesions according to age groups

Lesion Category	Diagnosis	Up to 20 years	21–30 years	31–40 years	41–50 years	51–60 years	>60 years	Total	%
Inflammation	Acute mastits	5	25	15	6	3	2	56	13.02
	Chronic nonspecific mastitis	0	4	2	0	0	0	6	1.3
	Chronic granulomatous mastitis	0	0	7	2	1	1	11	2.55
	Eosinophilic abscess	0	0	0	1	0	0	1	0.23
	Duct ectasia	0	1	0	0	0	0	1	0.23
	Fat necrosis	0	1	4	4	2	1	12	2.79
Cystic lesion	Galactocele	0	3	0	0	0	0	3	0.7
	Benign cystic lesion	1	6	4	2	2	0	15	3.48
	Fibrocystic disease	0	2	6	2	1	0	11	2.56
Benign neoplasm	Lactating adenoma	0	0	1	0	0	0	1	0.23
	Fibroadenoma	40	57	31	9	0	0	137	31.86
	Benign phyllodes	0	1	1	0	0	0	2	0.46
	Benign proliferative disease	3	2	5	3	1	0	14	3.25
Atypia	ADH	0	2	4	4	0	0	10	2.32
	Suspicious malignancy	0	1	3	1	2	2	9	2.09
Malignant neoplasm	Carcinoma/Lymphoma	0	2	15	38	20	24	99	23.02
Others	Fatty tissue	1	1	2	3	1	0	8	1.86
	Inadequate smears	1	3	4	4	0	0	12	2.79
	Normal breast tissue	3	5	0	1	0	0	9	2.09
	Gynaecomastia	2	1	1	2	0	4	10	2.32
	Lipoma	0	1	1	1	0	0	3	0.7
Total		56	118	106	83	33	34	430	100
%		13.02	27.44	24.65	19.3	7.67	7.9	100	

(99 = 23.02%) and benign cystic disease (15 = 3.48%) cases. Inflammatory lesions were acute mastitis 56 (13.02%), granulomatous mastitis 11 (2.55%), chronic mastitis 6 (1.3%), and fat necrosis 12 (2.79%). 42 (9.77%) cases designated as "others" included fatty tissue, lipoma, normal breast tissue, gynecomastia, and inadequate smears [Table 4].

The highest number of fibroadenoma (57) was in the age group of 21–30 years and <20 years group was second (40). Maximum of carcinoma cases were in the age group of 41–50 and 51–60 years of age group (38 and 20, respectively). Among the inflammatory lesions, the highest number was seen in the age group of 21–30 years group.

We found 11 (2.55%) cases of granulomatous mastitis. Among them, 4 (36.4%) were non-caseating and 7 (63.6%) were caseating consistent with tuberculosis. Ziehl–Neelsen stain of the suspected tuberculosis cases was done and found that 5 (45.45%) cases were positive for acid-fast bacilli (AFB) [Table 5].

The mean age of the suspicious for malignant cases was 48.2 ± 11.88 years, malignant cases was 53.4 ± 13.66 years, and benign cases was 32.0 ± 12.11 years [Table 6].

Regarding side involvement, almost in all cases, either the left or right side involvement was nearly equal [Table 7].

Mean lesion size of all 430 breast lesions was 3.37 ± 2.08 cm and mean lesion size of 99 malignant cases was 4.9 ± 2.21 cm. Among malignant lesions, 11.11% were presented with a size <2 cm, 67.67% with 2–5 cm, and 19.19% presented with >5 cm [Table 8].

The cytological spectrum of various malignant breast lesions encountered in the present study shows that out of the total 99 cases that could be satisfactorily labeled as malignant, infiltrating ductal carcinoma (IDC) accounted for 84 (84.84%) cases, mucinous carcinoma, poorly differentiated carcinoma, Paget's disease, neuroendocrine carcinoma, and sarcoma for 2 (2.22%) cases each, and

Table 5: Frequency distribution of types of granulomatous mastitis

Granulomatous inflammation	Frequency *n* (%)	AFB positive
Non-caseating granulomatous inflammation	4 (34.4)	Not done
Caseating granuloma consistent with tuberculosis	7 (63.6)	5
Total	11 (100)	5

AFB: Acid-fast bacilli

Table 6: Statistics of age (years) among different diagnoses

Cytological categories	Number	Mean±SD	Median	Range
C1 unsatisfactory	12	34.6±9.51	34.5	20–50
C2 benign	300	32±12.11	30	13–78
C3 atypia probably benign	10	38.2±7.47	39	26–50
C4 suspicious of malignancy	9	48.2±11.88	50	30–65
C5 malignant	99	53.4±13.66	50	30–100
Total	430	38±15	35	13–100

Table 7: Side involvement by different breast lesions

Cytological categories	Right *n* (%)	Left *n* (%)	Bilateral *n* (%)	Total
C1 unsatisfactory	04 (33.33)	05 (41.66)	03 (25)	12
C2 benign	128 (42.66)	152 (50.66)	20 (6.66)	300
C3 atypia probably benign	03 (30)	07 (70)	0	10
C4 suspicious of malignancy	03 (33.33)	04 (44.44)	02 (22.22)	09
C5 malignant	52 (52.52)	47 (47.47)	0	99
Total	190 (44.18)	215 (50)	25 (5.81)	430

Table 8: Size of malignant breast lesions

Malignant breast lesion	Size of the malignant breast lesion (%)			Total	Palpable axillary LN
	<2 cm	2–5 cm	>5 cm		
Ductal carcinoma (NOS)	9 (10.7)	57 (67.85)	16 (19.04)	84	25
Other carcinomas/lymphoma/sarcoma	02 (13.33)	10 (66.66)	03 (20)	15	02
Total	11 (11.11)	67 (67.67)	19 (19.19)	99	27

medullary carcinoma, lobular carcinoma, carcinoma with osteoclastic type giant cell, metaplastic, and lymphoma for 1 (1.53%) case each [Figure 1].

Among 99 malignant cases, only 27 showed palpable axillary lymph nodes and 12 (12.12%) cases of these showed the presence of metastasis and rest 15 (15.15%) were reactive lymph nodes [Table 9].

DISCUSSION

The study population ranged from 13 to 100 years with a mean age of 38 years. Rahman and Islam,[7] from Bangladesh, reported 14–86 years with a mean age of 33.6 years. Ahmed et al.,[8] from Sudan, reported 15–85 years of age range with a mean of 37 years. Bukhari et al.[9] showed a range of 16–70 years in Pakistan, Kumar[10] reported 6–72 years and Tiwari[11] 17–56 years in Nepal with a mean age of 34 and 32 years, respectively, and 18–92 years with a mean age of 59.3 years were reported by Dennison et al.[12] in the United Kingdom (UK). The higher mean age of this study from Nepal, Pakistan, and Bangladesh may be explained by the increased life expectancy rates from those countries. Again the lower mean age from the study of the UK is also may be due to lower life expectancy rate of India compared to the UK.

In this study, the lesion presented in the right breast was 44.19%, the left breast was 50.00%, and 5.81% of cases involved bilateral breast that was similar to the study of Rahman and Islam[7] in which the right breast was 49.05%, the left breast was 47.55%, and 3.4% of cases involved both. Kumar[10] observed a deviation from our results with a little predominance of the right breast (51.4%). This might an incidental finding and it required very large group

population-based study to find out any significant difference. Regarding malignant cases, we observed 52.52% of cases involved the right side, 47.47% involved the left, and none involved both. Similar to the study of Rahman and Islam[7] 49.60% of cases involved the right side, 48.81% involved the left, and 1.59% involved both, and Sankaye and Dongre[13] and Rupom et al.[14] found 58.18% of malignant lesion in the right breast. This is in contrast with the findings of Meena et al.,[15] Reddy and Reddy,[16] and Clegg-Lamptey and Hodasi[17] in which the left side was slightly more common.

The present study shows similar case distribution that of Sankaye et al.[14] but accounted for less number of benign cases and more number of malignant cases than Mohammed et al.,[18] Yeoh and Chan,[19] Park and Ham,[20] Rocha et al.,[21] and Domínguez et al.[22] Incidence of suspicious lesions and atypical lesions in the present study is almost same as that in other studies. Although the finding of unsatisfactory lesions in the present study is more than in the study by Mohammed et al.,[18] it, still, is much less than the majority of other studies, Table 10.

Among the granulomatous mastitis, we found that 5 (45.45%) cases were positive for AFB and Rahman and Islam[7] found 12 cases positive for AFB (12/116).

Fibroadenoma was the major, 31.86%, cause of the breast lump in this study; findings were similar to 28.57% of Rahman and Islam,[7] 28% of Ahmed et al.,[8] and near similar to the findings of Kumar[10] 22%. Besides, Bukhari et al.[9] showed 16% and Pradhan and Dhakal[23] showed only 8% of fibroadenoma cases.

A total number of 10 (2.32%) cases of atypical ductal hyperplasia (ADH) and 9 (2.09%) cases of suspicious for malignancy were found. Rahman and Islam[7] reported 1.12% of cases of ADH and 1.60% of cases of suspicious for malignant cells. Pradhan and Dhakal[23] reported 2.3% and Ahmed et al.[8] 2.5%.

Considering malignant cases, we found 99 (23.02%) malignant breast lesion, of these, 84 (84.84%) were ductal carcinoma. Rahman and Islam[7] found 252 (14.17%) carcinoma cases, among which 251 cases were ductal carcinoma and only

Table 9: Axillary lymph node status in the carcinoma patients

Lymph Node	Number of cases (%)
Metastatic	12 (12.12)
Reactive	15 (15.15)
Not palpable	74 (74.74)
Total	99 (100)

Table 10: Cytological cases comparative study

Cytological type	Present study (%)	Sankay et al.[13] (%)	Mohammed et al.[18] (%)	Yeoh and Chan[19] (%)	Park and Ham[20] (%)	Rocha et al.[21] (%)	Dominguez et al.[22] (%)
C1 unsatisfactory	12 (2.79)	13 (5.77)	3 (1.9)	274 (17.83)	169 (25.3)	71 (8.77)	142 (10.15)
C2 benign	300 (69.76)	131 (58.22)	112 (71.3)	1121 (73.12)	384 (57.4)	615 (76.02)	1087 (77.75)
C3 atypia probably benign	10 (2.32)	8 (3.55)	2 (1.3)	51 (3.32)	24 (3.6)	-	-
C4 suspicious of malignancy	09 (2.09)	8 (3.55)	2 (1.3)	19 (1.23)	7 (1.0)	26 (3.21)	20 (1.14)
C5 malignant	99 (23.02)	65 (28.88)	38 (24.2)	68 (4.43)	85 (12.7)	97 (12)	149 (10.65)
Total	430	225	157	1533	669	809	1398

one was lobular carcinoma. Sankaye and Dongre[13] found 65 (28.8%) malignant lesions, IDC was most common 55 (88.60%) and mucinous carcinoma was the second most common tumor in there study with 4 (6.15%) cases while in the study by Domínguez *et al.*[22] 147 malignant cases were seen, 141 (95.91%) were IDC and lobular carcinoma was the second common tumor in the study by Domíngue *et al.* with 4 (2.72%) cases.[22] We found mucinous carcinoma, poorly differentiated carcinoma, Paget's disease, neuroendocrine carcinoma, and sarcoma for 2 (2.22%) cases each, and medullary carcinoma, lobular carcinoma, carcinoma with osteoclastic type giant cell, metaplastic, and lymphoma for 1 (1.53%) case each. Diagnosis was made as per literature.[24-34]

CONCLUSION

Primary categorization of breast lumps into unsatisfactory, benign, inflammatory, atypical/suspicious, and malignant categories can be done by FNAC. FNAC is a cheaper, rapid, less invasive, and effective method. Benign breast lesions are common than malignant lesions, fibroadenoma for benign disease, whereas IDC accounts for the highest number of malignant lesions.

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